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मानक

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Mazdoor Kisan Shakti Sangathan

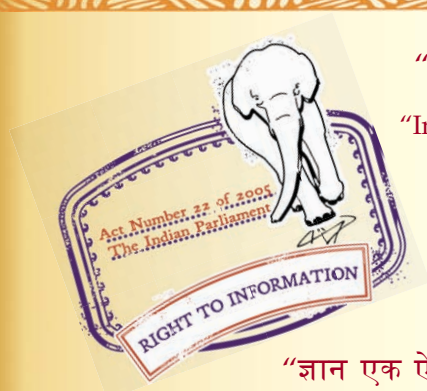
“The Right to Information, The Right to Live”

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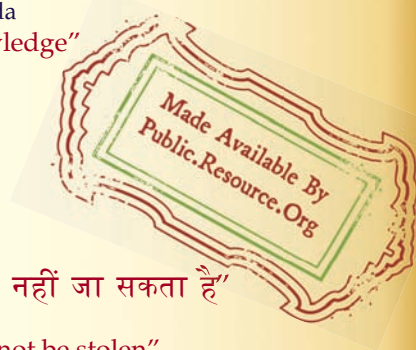
IS 15907 (2010): Agro Textiles - High Density Polyethylene (HDPE) Woven Beds for Vermiculture [TXD 35: Technical Textiles for Applications]



“ज्ञान से एक नये भारत का निर्माण”

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrihari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

कृषि वस्त्रादि — जीवाशुव द्वि हेतु उच्च घनत्व वाले
पालीइथाईलीन (एच डी पी ई) के बुने हुए
क्यारीनुमा बिस्तर — विशिष्टि

Indian Standard

**AGRO TEXTILES — HIGH DENSITY POLYETHYLENE
(HDPE) WOVEN BEDS FOR VERMICULTURE —
SPECIFICATION**

ICS 65.080;83.020.20;83.140.01

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Technical Textiles for Agro-tech Sectional Committee had been approved by the Textile Division Council.

Today's agriculture or farming is in great threat due to regular use of chemical fertilizers. The soil texture is being deteriorated and becoming salinated. There is no incremental output and even quality of soil is also deteriorating and crops are increasingly becoming prone to various diseases. This leads to increased expenditure on agro-medicines. Most important is the decay of various/useful organic factors from the soil. Here organic fertilizers play a major role in maintaining the texture, quality and yield of the soil. Organic fertilizer is nothing but fertilizer produced by decomposition of organic waste of agro based products. This fertilizer provides all sixteen types of main, subsidiary and micro-nutrients with different vitamins and digestive elements. Traditionally cement structures were used for the purpose but of late portable beds made from plastics have made entry into the market. These synthetic beds enjoy greater advantages over the traditional ones in terms of space, durability, ease of handling, yield of compost, cost, etc.

The composition of the Committee responsible for the formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRO TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE) WOVEN BEDS FOR VERMICULTURE — SPECIFICATION

1 SCOPE

This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven beds for vermiculture used in producing compost for agricultural purposes.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply.

3.1 Vermicompost — It is well decomposed stable, fine granular byproduct from composting process mediated through the activities of earthworm.

3.2 Vermiculture — The process of producing vermicompost is called vermiculture. The earth worm gives excreta fast, after eating any kind of decayed decomposed organic material. Hence, the crop/plants can get the additional nutrients from vermicompost. *Eisena foetida* worm may be used in the process.

3.3 Vermiwash — The liquid collected at the drain of the bed is called vermiwash. This liquid consists of different micro-nutrients vitamins and digestive elements. Earthworm excretes a sticky liquid from its glandor. This contains *Colamic pyulite* and antifungal liquid.

4 MATERIALS

4.1 HDPE Tapes

Tapes shall be manufactured from HDPE granules (*see* IS 6192), which shall be UV stabilized by adding suitable UV stabilizer (*see* Note). The finished bed shall meet the requirements of UV stability and colour fastness to light as given in Table 1. The width of the tape used in the fabric shall be 1.20 mm minimum and

linear density of the tape shall be 88.8 Tex (800 Denier) minimum.

NOTE — Carbon black or black master batch shall not be used for UV stabilization.

4.2 HDPE Fabric

Beds shall be manufactured by using suitable HDPE woven fabric (*see* IS 6899) so that finished bed meets the requirements given in Table 1 and 5.1 to 5.3.

4.3 Lamination

4.3.1 The fabric shall be laminated with the low density polyethylene (LDPE) or suitable combination of LDPE and linear low density polyethylene (LLDPE) melt of coating grade on each side having thickness not less than 25 microns and the coating shall be suitably UV stabilized by incorporating UV stabilizer (*see* Note under 4.1). The coating film along with colour master batch to get the desired shade shall be such that the finished bed meets the requirements of UV stability and colour fastness to light as given in Table 1.

4.3.2 A 7-layer laminated fabric is produced using a combination of 3-layers of HDPE fabric and 4-layers of coating film. The layers of HDPE fabric used to manufacture beds shall be joined by sandwich lamination. The lamination as given above shall be such that the finished bed meets the requirements given in Table 1. The minimum coating thickness of the sandwich lamination shall be 40µ.

4.4 Cord Beading

A jute/sisal rope beading of minimum 6.0 mm diameter shall be provided along the top periphery of the bed for reinforcement.

5 MANUFACTURE

5.1 General design of the bed shall be as shown in Fig. 1.

5.2 Construction

5.2.1 The bed shall be constructed by heat sealing laminated pieces of woven fabric of the desired dimensions. The panels shall be flat (overlap) joined. The top edges of the bed shall be hemmed by heat

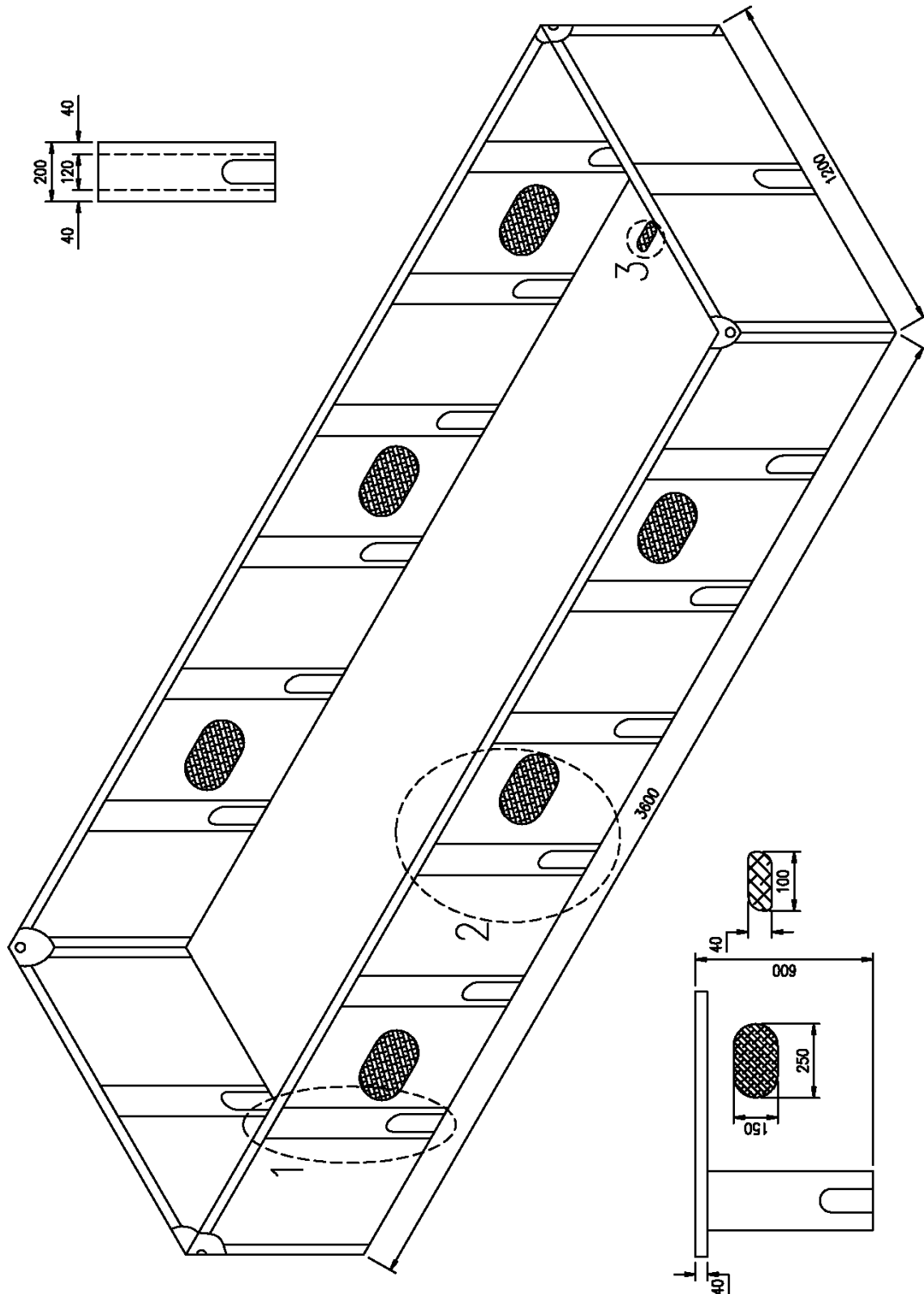


FIG. 1 TYPICAL SHAPE OF A VERMIBED

sealing along with a jute/sisal rope of 6 mm diameter placed inside the hem as reinforcement. The width of the hem shall be minimum 40 mm. Three net windows of size 260 mm × 150 mm each shall be provided on both sides of the bed along the length for ventilation. These windows shall be made of polyethylene nets and shall be heat sealed at equidistance along the periphery of the bed as shown in Fig. 1. An outlet of 40 mm × 100 mm at the bottom in one corner shall also be provided for draining out the liquor produced during the process of composting. This outlet shall be covered by polyethylene nets and shall be heat sealed.

5.2.2 Fourteen support pockets for inserting pegs shall also be provided along the periphery of the bed and running across the full height of the bed as shown in Fig. 1. A piece of laminated woven fabric is heat-sealed at the intersection of front/back and bottom panels whereas the other three sides of the fabric for pockets are heat-sealed with the base fabric thus giving the shape of a pocket. The upper end of the pocket thus formed shall be heat-sealed while forming the hemming at the top edge of the bed (*see 5.2.1*) whereas at the bottom end, a hole of suitable diameter shall be created for inserting wooden pegs having a diameter of 40 mm. The pockets shall have a finished width of 120 mm. The wooden pegs shall be strong enough to provide an erected structure and perform the desired function.

5.3 Bonding

If two or more pieces of fabrics are used for the manufacture of bed, the woven fabrics shall be bonded together by a suitable heat sealing process keeping an overlap of at least 2.5 cm.

6 REQUIREMENTS

The laminated HDPE fabric used to manufacture bed shall meet the requirements as given in Table 1. Besides the bed shall meet the requirements stated in 5.1 to 5.3.

6.1 Dimensions and Mass

The bed shall be made to the shade and dimensions as specified in the contract or order. The following tolerance shall be permissible for length, width and mass (g/m²):

<i>Dimension</i>	<i>Tolerance, Percent</i>
Length	±1
Width	±1
Mass (g/m ²)	±6 percent on declared mass subject to minimum mass of 340 g/m ²

However, the preferred dimensions of the bed shall be 3 600 mm (*L*) × 1 200 mm (*W*) × 600 mm (*H*).

6.2 Water Proofness

6.2.1 The fabric and joints of the bed shall be tested before and after ageing for water repellency by cone test according to IS 7941 and for resistance to water penetration by the pressure head test according to IS 7940 keeping the height of water column as 900 mm and the time of exposure being 1 h. The test specimen shall be so selected that at least one joint is covered. There shall be no leakage when tested by cone test and does not leak through the bed when tested for resistance to water penetration by the pressure head test from any test specimen.

6.2.2 The ageing shall be done at 70°C for 168 h as per the method given in IS 7016 (Part 8).

7 MARKING

7.1 Each bed shall be legibly marked with the following information at one corner on one side either with tag or by printing on it with the ink:

- Name and address of the manufacturer,
- Dimensions and mass (g/m²), and
- Year of manufacture.

7.2 BIS Certification Marking

The beds may also be marked with the Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and Rules and Regulations made thereunder. The details of the conditions under which a license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 PACKING

The beds shall be packed as agreed to between the buyer and the seller.

9 SAMPLING

9.1 Lot

The quantity of bed of same size and mass (g/m²) manufactured under similar conditions and delivered to a buyer against one dispatch note shall constitute a lot.

9.2 Unless otherwise agreed to between the buyer and the seller, the number of beds to be selected at random from a lot shall be as given in col 3 of Table 2.

10 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 3.

Table 1 Requirements of Beds Made from HDPE Woven Fabrics
(Clauses 4.1, 4.2, 4.3.1, 4.3.2 and 6)

SI No. (1)	Characteristic (2)	Requirements (3)	Method of Test, Ref to (4)
i)	Mass, g/m ² , <i>Min</i>	340 (<i>see 6.1</i>)	IS 1964
ii)	Breaking strength before UV exposure, N, <i>Min</i>	1 900 (Warp) } 1 300 (Weft) }	IS 1969
iii)	Elongation at break, percent	20 ± 5	IS 1969
iv)	Retention of breaking strength after UV exposure, N, <i>Min</i>	85 percent of original actual value (fabric)	Annex B and IS 1969
v)	Welded seam strength before UV exposure, N, <i>Min</i>	65 percent of original actual value (fabric)	IS 1969
vi)	Welded seam strength after UV exposure, N, <i>Min</i>	85 percent of original actual value	Annex B and IS 1969
vii)	Tear strength, N, <i>Min</i>	100 (Warp) } 100 (Weft) }	Method A2 of IS 7016 (Part 3)
viii)	Puncture strength, N, <i>Min</i>	325	Annex C
ix)	Environmental stress cracking test	There shall be no evidence of stress cracking	Annex D
x)	Resistance to chemicals, change in the mass, percent, <i>Max</i>	0.1 percent	Annex E
xi)	Colour fastness to artificial light ¹⁾	4 or better	IS 2454 (Xenon lamp method)
xii)	Bursting pressure, kgf/cm ² , <i>Min</i>	35	IS 1966

¹⁾ Applicable for coloured beds only.

Table 2 Scale of Sampling
(Clause 9.2)

SI No. (1)	No. of Beds in Lot (2)	Sample Size (3)	Sub-sample Size (4)	Permissible No. of Defective Beds (5)
i)	Up to 50	3	2	0
ii)	51-150	5	2	0
iii)	151-300	8	3	1
iv)	301-500	13	5	2
v)	501 and above	20	5	3

Table 3 Number of Test Specimens and Criteria for Conformity
(Clause 10)

SI No. (1)	Characteristic (2)	No. of Beds/Test Specimens (3)	Criteria for Conformity (4)
i)	Dimensions, average mass (g/m ²), manufacture and material	According to col 3 of Table 2	The defective beds do not exceed the corresponding number given in col 5 of Table 2
ii)	Water proofness	According to col 4 of Table 2	All the test specimens shall pass the test
iii)	All other requirements	According to col 4 of Table 2	The test specimens shall meet the requirements as given in Table 1

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (<i>second revision</i>)	6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification (<i>second revision</i>)
1966 : 1975	Methods for determination of bursting strength and bursting distention of fabrics — Diaphragm method (<i>first revision</i>)	6899 : 1997	Textiles — High density polyethylene (HDPE) woven fabrics — Specification (<i>second revision</i>)
1969 : 1985	Methods for determination of breaking strength and elongation of woven textile fabrics (<i>second revision</i>)	7016	Methods of test for coated and treated fabrics:
2454 : 1985	Methods for determination of coloruv fastness of textile materials to artificial light (Xenon lamp) (<i>first revision</i>)	(Part 3) : 1981	Determination of tear strength (<i>first revision</i>)
		(Part 8) : 1975	Accelerated ageing
		7940 : 1976	Methods for determining resistance to penetration by water of fabrics by static pressure head test
		7941 : 1976	Method for determining water repellency of fabrics by cone test

ANNEX B

[Table 1, Sl No. (iv) and (vi)]

UV RESISTANCE TEST

*a***B-1 TEST SPECIMENS**

The test specimens for breaking and seam strength shall be cut from the sample as specified in IS 1969 for modified grab test.

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UV-B lamp (313 nanometer or its equivalent).

B-2.2 The duration of the test shall be 144 h (that is 6 days).

B-2.3 The test cycle shall be 8 h at $60 \pm 3^\circ\text{C}$ with UV radiation alternating after 4 h at $50 \pm 3^\circ\text{C}$ with condensation.

B-2.4 Irradiation level throughout the test shall be maintained at $0.63 \pm 0.03 \text{ W/m}^2$.

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength and seam strength of bed specimens separately as per the modified grab test specified in IS 1969.

B-3.2 Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

B-3.2.1 The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be specified in **B-2**.

B-3.3 Determine the average breaking strength and seam strength of the specimens separately after UV exposure as mentioned above.

B-3.4 Determine the percent retention of original strength and seam strength as follows:

Percent retention of original breaking strength or seam strength = $\frac{a}{b} \times 100$

where

a = average breaking strength or seam strength before UV exposure as obtained in **B-3.1**, and

b = average breaking strength or seam strength after UV exposure as obtained in **B-3.3**.

NOTES

1 The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).

2 Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.

ANNEX C

[Table 1, Sl No. (viii)]

TEST METHOD FOR INDEX PUNCTURE RESISTANCE

C-1 PRINCIPLE

A test specimen is clamped without tension between circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the centre of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator until rupture of the specimen occurs. The maximum force recorded is the value of puncture resistance of the specimen.

C-2 APPARATUS

C-2.1 Tensile/Compression Testing Machine, of the constant-rate-of extension (CRE) type.

C-2.2 Ring Clamp Attachment, consisting of concentric plates with an open internal diameter of 45 ± 0.025 mm capable of clamping the test specimen without slippage. A suggested clamping arrangement is shown in Fig. 2. The external diameter is suggested to be 100 ± 0.025 mm. The diameter of the six holes used for securing the ring clamp assembly is suggested to be 8 mm and equally spaced at a radius of 37 mm. The surfaces of these plates can consist of grooves with a-rings or coarse sandpaper bonded onto opposing surfaces.

C-2.3 Solid Steel Rod, with a diameter of 8 ± 0.01 mm having a flat end with a $45^\circ \times 0.8$ mm chamfered edge contacting the test specimen's surface (*see* Fig. 2 and 3).

C-3 SAMPLING**C-3.1 Laboratory Sample**

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of **C-3.2** can be met.

C-3.2 Test Specimens

Select from the laboratory sample, sufficient number of samples each having a minimum diameter of 100 mm to facilitate clamping. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the bed.

C-4 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing beds (65 ± 5 percent relative humidity and $27 \pm 2^\circ\text{C}$ temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

C-5 PROCEDURE

C-5.1 Select the load range of the tensile/compression testing machine such that the rupture occurs between 10 and 90 percent of the full-scale load.

C-5.2 Centre and secure the specimen between the holding plates ensuring that the test specimen extends to or beyond the outer edges of the clamping plates.

C-5.3 Test at a machine speed of 300 ± 10 mm/min until the puncture rod completely ruptures the test specimen.

NOTE — The rate of testing specified is not an indication of the performance of the specimen for its end use.

C-6 CALCULATION

Calculate the average puncture resistance and standard deviation for all tests as read directly from the recording instrument.

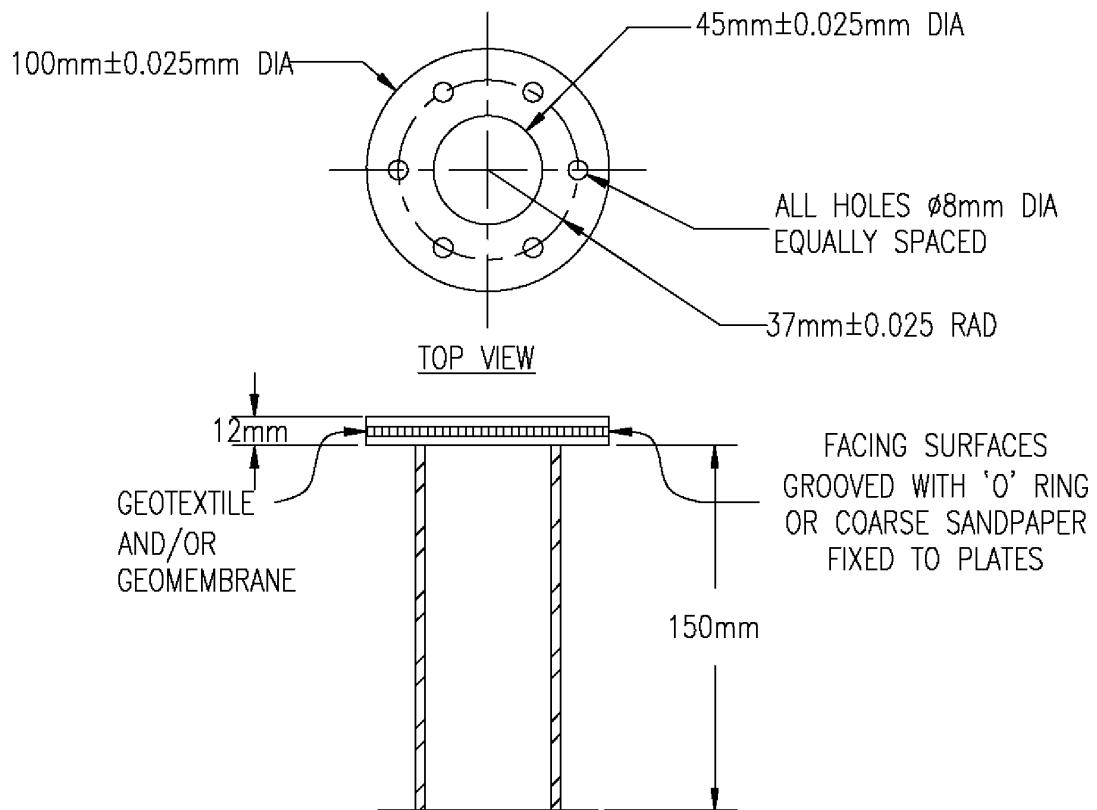


FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

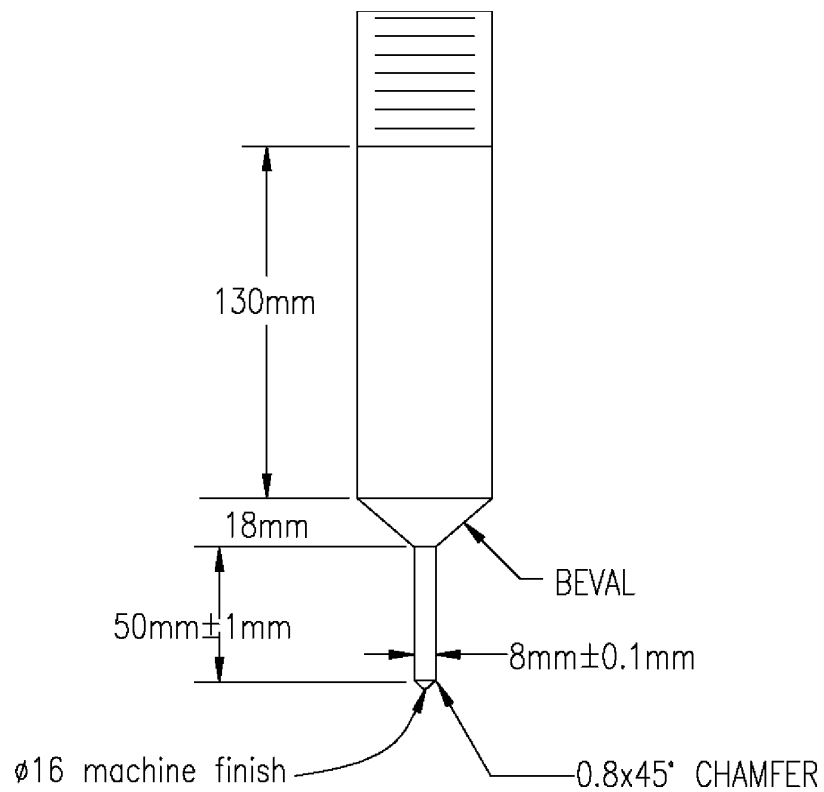


FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

ANNEX D
[Table 1, Sl No. (ix)]

METHOD OF TEST FOR RESISTANCE TO ENVIRONMENTAL STRESS CRACKING

D-1 APPARATUS

An air oven controlled at $60 \pm 2^\circ\text{C}$.

D-2 TEST LIQUID

A 0.5 percent aqueous solution of polyoxyethylated nonylphenol.

NOTE — Teepol B 300 has been found suitable.

D-3 TEST SPECIMEN

The test specimens shall be cut from the bed and

shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

D-4 PROCEDURE

The test specimen shall be dipped in the test liquid contained in a beaker at $27 \pm 2^\circ\text{C}$. The beaker along with test specimen shall be kept in the oven at $60 \pm 2^\circ\text{C}$ for 48 h. The test specimen shall then be inspected for cracks, the test specimen being sectioned where necessary.

ANNEX E
[Table 1, Sl No. (x)]

TEST FOR RESISTANCE TO CHEMICAL ACTION

E-1 TEST SPECIMEN

The test specimens shall be cut from the bed and shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

E-2 PROCEDURE

For test in each solution as mentioned herein under below, three specimens each of length of 150 ± 3 mm and width of 50 ± 3 mm taken from three position of bed shall be cleaned, wiped dry and weighed and then totally immersed without prior conditioning in each

of 10 percent aqueous solution of sulphuric acid, hydrochloric acid, sodium hydroxide, sodium chloride and ammonium hydroxide at ambient temperature for 72 h separately. After the specified time, the specimens shall be removed from each solution, washed in running water for 5 min, dried with a clean cloth and re-weighed immediately.

E-3 ASSESSMENT OF RESULT

The average change in mass of all three specimen in each solution shall not exceed the value given in Table 1.

ANNEX F

(Foreword)

COMMITTEE COMPOSITION

Technical Textiles for Agro-tech Sectional Committee, TXD 35

<i>Organization</i>	<i>Representative(s)</i>
Indian Agricultural Research Institute, New Delhi	DR H. S. GUPTA (Chairman)
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Central Institute of Plastics Engineering & Technology (CIPET), Bhubaneswar	DR S. N. YADAV
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National Committee on Plasticulture Application in Horticulture, New Delhi	SHRI KRISH S. IYENGAR SHRI NARESH MODI (<i>Alternate</i>)
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The Bombay Textile Research Association, Mumbai	SHRI V. K. PATIL SHRI C. H. SAKHARKAR (<i>Alternate</i>)
The Synthetic & Art Silk Mills Research Association, Mumbai	DR MANISHA MATHUR SHRIMATI MANISHA A. HIRA (<i>Alternate</i>)
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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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